

INTERNAL PARASITES

OF

POULTRY

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The Internal Parasites of Poultry

By E. A. BRUCE

FOREWORD

Probably no class of live stock suffers more from the ravages of parasites than does poultry. Such a condition is very largely preventable, and it is with such a thought in mind that this leaflet is prepared. The facts presented are for the most part not new, and in their compilation current literature has been freely drawn upon when necessary. In general, it can be said, that poultry cannot be kept on the same ground year after year without harm resulting from parasitism. To intelligently control parasites requires some knowledge of the parasite involved: when this is known, and attention is paid to sanitation, rotation of yards, and special consideration is given to young birds, the poultryman will save himself both money and grief.

COCCIDIOSIS

Coccidiosis is an exceedingly common and widely spread disease of birds and animals caused by minute forms of animal life known as coccidia.

There are many different kinds of coccidia, but so far as is known each kind affects only one kind of animal or bird. For example those affecting cattle do not affect goats, dogs, fowls or other animals. Although coccidia are so strictly selective in their hosts, it does not follow that the host is affected by only one kind of coccidium. Rabbits, for example, are affected by at least three different species of coccidia, and it is now thought that domestic fowls may be parasitized by at least six species.

Even though a coccidium be one that affects certain birds it does not follow that it will affect other forms of bird-life. Geese, turkeys, pheasants, pigeons and sparrows all have their own kinds of coccidia, and all of these appear to be different from those affecting domestic fowls.

The Parasite

The parasite causing coccidiosis of fowls is taken in by the mouth, passes part of its life in the intestine, and is then passed out with the droppings.

All of the six species of coccidia known to affect domestic fowls belong to the genus called *Eimeria*, the life-cycle of which is as follows:—

At the time such a coccidium is passed in the droppings it resembles a translucent double walled egg, known as an oocyst, and is too small to be seen without the aid of a microscope. Thousands of these oocysts may be passed by an affected bird in a single dropping. When first passed the contents of an oocyst are usually in a more or less spherical mass, somewhat analogous to the yolk in an egg. At this stage the oocyst is not capable of producing disease.

In the course of forty-eight hours, more or less, depending upon suitable conditions of air, moisture and temperature, the contents of the oocyst divides into four bodies, each of which then divides in two. At this stage the oocyst is capable of producing coccidiosis, and being highly resistant to adverse conditions may still be dangerous after the lapse of one, or even two or three years.

Upon being swallowed by a suitable host the eight minute torpedo-shaped bodies (sporozoites) in the oocyst are liberated. Each of these is capable of penetrating the mucous membrane of the intestine, where it grows and divides into a varying number of bodies (merozoites) which are very similar in appearance to those that left the oocyst. Each of these may now penetrate the lining membrane of the gut and finally emerge as a number of bodies similar to the original one. This production of merozoites by merozoites continues for an undetermined number of times. Just what this means can perhaps best be appreciated by assuming that all eight bodies in a single oocyst penetrate the gut wall, and emerge as twenty merozoites (a conservative number), each of which produces twenty, and that this happens twice more, results in the staggering total of over a million and a quarter parasites from a single oocyst.

Up to this point the parasites have shown no sex differentiation, but the merozoites after penetrating the gut wall and emerging as merozoites for an undetermined number of times, now penetrate the gut as before but for some unknown reason develop quite differently. Some develop as female cells and others as male; after fertilization the female cell becomes an oocyst, which when fully developed leaves the intestinal mucous membrane and is passed out with the faeces.

In domestic fowls the time elapsing between infection and the passage of oocysts is approximately one week.

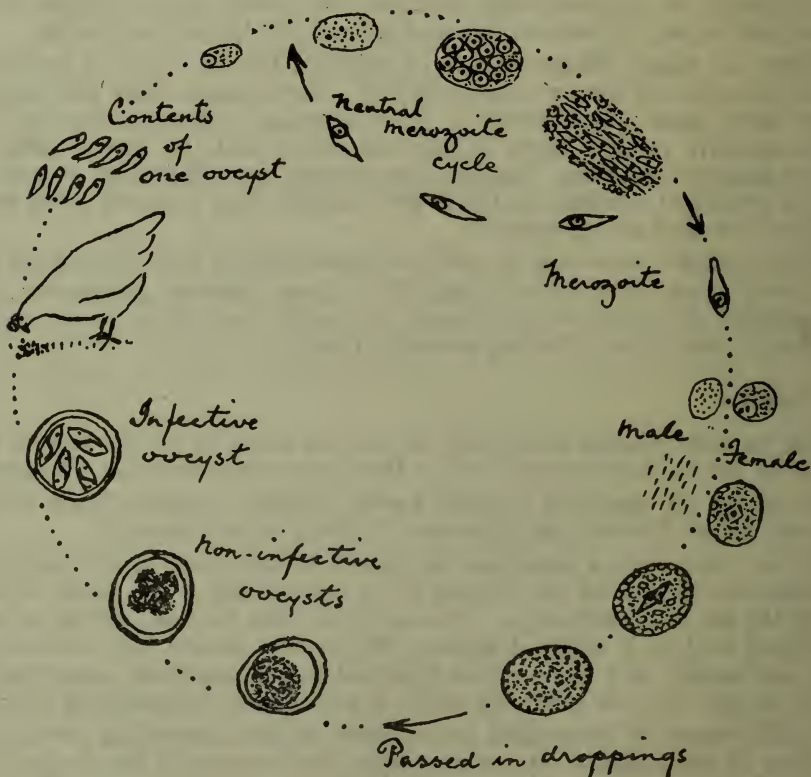


Diagram of the various stages in the life cycle of a coccidium of poultry

How the Disease is Contracted

Coccidiosis is spread by the droppings of affected birds, and is contracted through the mouth, through contamination of food, water and soil.

There does not appear to be any evidence that coccidia are ever found inside an egg, but the eggshell may be contaminated. Such eggshells might be the means whereby very young chicks are infected, but such a mode of infection is extremely unlikely.

Coccidia may be carried mechanically in many different ways and for considerable distances: by wind, in running water, on automobile tires, shoes or other objects, or by flying birds and insects, or by rats, mice and other animals.

With so many means of distribution one can understand why it is that the disease occasionally appears in incubator-raised chicks, kept in a new brooder house, and turned out on ground not previously used by poultry. However, in such cases the most probable source of infection is from the droppings of mature fowls adherent to the attendant's shoes.

Symptoms and Diagnosis

While birds of all ages may be affected the disease is most commonly seen in those from two weeks to ten weeks old.

Mature birds usually show no symptoms, and this is apparently due to the fact that light attacks earlier in life produce a certain resistance to subsequent attacks.

In young chicks the disease develops rapidly and the mortality is high. Such birds are listless, unthrifty, stand apart from the others with their eyes closed, feathers ruffled, and hold the head close in to the body, giving them a bunched-up appearance. The droppings are usually moister than normal, and may be whitish or brownish in colour and may contain blood. Death takes place in from one to several days after the first symptoms are noticed. Those that recover are usually stunted and worthless.

In some cases of acute infection the bird dies suddenly without having shown any outstanding symptoms, about all that is noticeable being a pale comb and a little blood on the vent fluff.

In older birds the disease usually assumes a more chronic form characterized by paleness of the comb, wattles and shanks, wasting, and weakness sometimes accompanied by paralysis of the legs; the appetite is usually good but inclined to be erratic. Diarrhoea is usually present to some extent. Some birds recover, others die in the course of a few weeks and often quite suddenly.

The only really satisfactory means of diagnosing coccidiosis is by the aid of a microscope, especially in cases of chronic infection. However, the presence of bloody droppings in chicks from two to ten weeks of age can be accepted as strong evidence of a certain type of the disease. This evidence is practically conclusive if blood can be found in the caeca or blind pouches of the intestine, or in the intestine itself. In the later stages it is also common to find the caeca plugged with a yellowish cheese-like core in which are dark reddish areas.

In the more chronic cases a thickening of the intestinal wall with haemorrhages, or with whitish or greyish spots in the wall, can be looked upon as distinctly suspicious.

In pigeons the disease is usually characterized by dullness for a day or two before death, or it may assume a more chronic form in which diarrhoea and loss of weight are the prominent symptoms.

Turkeys as a rule are not severely affected by coccidia. A few are known to have died from this cause in British Columbia: in these cases turkey poults were noticed to be ill, were unsteady on their feet and walked backwards, death occurring the same day.

Coccidiosis of geese does not appear to have been recorded as occurring in Canada, but as the possibility exists the condition may be mentioned. These birds are subject to a peculiar type of coccidiosis in which the kidneys are involved. They lose flesh rapidly and become so weak that they are almost unable to walk, and lie most of the time with the belly resting on the ground. Some of them lie on their backs, and after being placed on their feet may take a few steps, fall, and then roll over with their feet in the air as before. Such birds become progressively weaker and eventually die.

Treatment

Many drugs have been tried but none have proved really satisfactory. The one most commonly recommended, and which does appear to have some value in some outbreaks, is crude catechu. One teaspoonful of crude catechu, previously ground to a coarse powder, is added to each three gallons of drinking water, and this is kept constantly before the birds for ten days. Should constipation develop (not usual) epsom salts should be given as follows: One tablespoonful (half an ounce) for twelve adult birds; for fifty chicks about four weeks old; for 100 very small chicks. The salts are dissolved in water and mixed in a mash, and are preferably given in the morning.

Probably the most effective treatment is the feeding of powdered skim milk or buttermilk so that it forms from 20 to 40 per cent of the mash. When this is fed the whole grain ration should be reduced one-third, and as more water will be drunk this should be supplied freely. This treatment should be continued for about ten days.

If the powdered milks are not available, sour milk or buttermilk should be fed liberally. When this is done the grain and mash ration should be reduced in quantity, not only to insure that more of the milk is taken but also to prevent sour crop. In severe outbreaks it is advisable to withhold the feeding of mash altogether for a few days. Green feed is fed as usual.

In the event of an outbreak other measures should be taken as outlined below, sanitation being of far greater importance than any treatment.

Prevention and Control

If only a few birds are affected they should be killed and the carcasses burnt. If a large number are affected the worst should be killed and the others isolated, and placed on new ground if possible. Every effort should be made to prevent reinfection. Birds that survive and are not reinfected are as a rule practically free of coccidia in about one month.

To prevent the coccidia passed in the droppings from developing to the infective stage, *droppings should be cleaned up every day*, and disposed of in such a manner as to prevent any possibility of further infection. In this lies the secret of success.

Infected houses should be thoroughly cleaned, and all scrapings, litter and dead birds, burnt. They should then be thoroughly disinfected by soaking any part contaminated by droppings with a 4 per cent solution of compound cresol or other coal-tar disinfectant, and this for preference should be applied hot. Other disinfectants can be used, but they should be in strong hot solutions. Oocysts of coccidia are difficult to kill, especially at the infective stage, so that half measures are simply wasted efforts.

After the floors have dried they should be covered with a thin layer of litter. This should be removed daily. No water should be used as moisture

is necessary for the development of coccidia. Fresh unslaked lime is valuable in drying-up and killing coccidia, and if a little is sprinkled on the floors and dropping boards and then swept up each day before fresh litter is put down, it will be an added precaution. There is, however, an element of danger attached to the use of unslaked lime, and it is best not used at all if there is any possibility of its being eaten.

It is an excellent plan to have two separate yards or cages, changing affected chicks from one to the other every day for fifteen days: daily cleaning of the floor by scraping and sweeping being simplified, and chances of reinfection greatly reduced.

On farms where extreme difficulty is encountered in raising chicks free of infection, they can be raised on half-inch mesh wire floors. These are raised off the ground so that the droppings pass through, and the birds have no contact with the soil which may be contaminated. When floors of this kind are used, the feed and water containers are placed on the outside of the pen: access to them is made through openings in the side of the pen.

Feed and water containers should be kept clean, and should be so placed that they cannot be contaminated by droppings or litter.

Infected ground should be well covered with unslaked lime and then ploughed, and should be stirred up at intervals and can be relimed with benefit. The only form of lime that is of value for disinfection of the soil is unslaked lime. If a crop is put in it should be a hoed crop. The more the ground is stirred and exposed to sunlight the better. Water holes should be drained or filled in. Such ground should not be used for poultry, if at all possible, for one year and preferably not for four years.

A systematic rotation of yards, so that the same ground is not used the second time by poultry until the fourth year, is highly recommended.

INTESTINAL WORMS

Intestinal worms are of common occurrence in domestic fowls, and are responsible for a considerable loss to the poultry industry, either directly through death or indirectly through loss of flesh and lowered production of eggs. Such parasites alone rarely cause death, but they lower the resistance of the bird so that it is more susceptible to other diseases.

Symptoms

As the symptoms produced by tapeworms and roundworms are very similar, the following remarks apply to both. Young stock suffer the most. The presence of a small number of parasites may cause no noticeable symptoms, but more trouble will be caused by a few tapeworms than by a few roundworms.

The symptoms shown by heavily parasitized birds are not distinctive, and could be found in other chronic conditions, but any doubts can usually be settled by examining the intestinal tract of a dead bird.

In general such symptoms are: Unthriftness, loss of weight, paleness of the head and shanks, and frequently diarrhoea. Leg weakness and paralysis may occur.

Post-mortem Appearances

The intestines should be opened with scissors and gently washed with tepid water in a dark-coloured pan. The white or yellowish worms can usually then be seen readily: there are, however, some that are too small to be detected easily, and some that require the aid of a microscope before they can be seen at all. The thread-like or cylindrical worms are the roundworms, and the ribbon-like, segmented worms are tapeworms. The latter are usually attached firmly to the intestinal wall.

TAPEWORMS

Life-history

Several different species of tapeworms occur in domestic fowls, and more than one species may occur in the same bird at one time. They vary in size from those that are imperceptible to the unaided eye to worms several inches in length.

The head of the worm is attached to the intestinal wall, and the worm grows from the region just back of the head into a number of flattened joints or segments. The segments furthest from the head being the oldest and usually the biggest. Both male and female organs occur in the same worm. The fully developed segments contain a large number of eggs. The ripe segments become detached and are passed out with the droppings, where they appear as white, glistening, round or oval objects, which may be mistaken for fly maggots.

To complete the development of the egg and the life-cycle of the worm it is now essential that some low form of animal life feed upon the ripe segments or eggs. Such a feeder, if the right one, is known as an intermediate host. The intermediate hosts for all the tapeworms have not been found, but in the majority of cases each species of tapeworm requires a different intermediate host. The hosts for tapeworms of poultry are known to be dung beetles, ground beetles, the house fly, snails, slugs and earthworms.

The intermediate host is eaten by a bird and the larval tapeworm is liberated, which then attaches itself to the intestinal mucous membrane and grows to maturity.

Treatment

The drug recommended against tapeworms of poultry is powdered kamala. It is marketed in the form of a tablet or can be given in capsules. The dose for an adult fowl is one gram; if the bird is in a weakened condition, or is not fully grown, one-half a gram is sufficient. Turkeys take from one to two grams, depending upon size and tolerance to the drug. It should not be given to birds suffering from other weakening diseases. If many birds are to be treated it is advisable to dose a few of the least valuable a couple of days before dosing the flock. This is advised because it has been found that certain flocks do not stand kamala well: the reason for this flock idiosyncrasy is not known. This precaution should always be taken in dealing with turkeys, with hens it is not so imperative although advisable. The drug may cause loss of appetite, lowered egg production, or even death. In using kamala no preliminary fasting nor after-treatment with a purgative is required.

Various other treatments for poultry tapeworms have been tried but none have proved as satisfactory as kamala. One of these which has given fair satisfaction is as follows:—

A tablespoonful of concentrated lye is added to a one-gallon mixture of wheat and oats, a little water is added and the mixture cooked slowly for about two hours, and then allowed to cool. No food is given the night before treatment; the following morning the birds are given as much of the lye-treated grain as they will eat, and as much water as they will drink. Twenty-four hours later a dose of epsom salts should be given, using about one pound for 100 birds. Treatment should be repeated in three or four weeks.

Prevention

While it is impossible to prevent fowls from eating flies and other small forms of life which are known to act as intermediate hosts for tapeworms, proper disposal of droppings will prevent such flies, etc., from eating the eggs

or segments passed by the birds. In addition to prompt and thorough disposal of droppings, efforts should be made to keep the different forms of intermediate hosts down to the minimum. This is largely a matter of sanitation and neatness. Old boards and other trash lying around the yard may harbour ground beetles and slugs; wet places should be drained or filled in, and piles of decaying hay, straw or weeds as well as manure should be removed. It is perhaps of interest to note that under favourable conditions as many as 1,200 house flies may develop in one pound of horse manure in eight to ten days. Other sanitary measures mentioned in connection with the prevention of roundworms will also be of value.

ROUNDWORMS

A number of different species of roundworms occur in the intestinal tract of poultry, three of which deserve special mention. They are the large roundworm or ascarid, the caecal worm or heterakid, and the hairworms or capillarids.

The Large Roundworm

These worms are frequently found in fowls. They measure from 1 to $4\frac{1}{2}$ inches when fully grown, and may be present in such numbers as to block the intestine. Young chicks are most seriously affected, and may die if heavily infested. Older birds are much more resistant and may swallow hundreds of worm eggs without showing symptoms of parasitism. It has been shown experimentally that chicks 103 days old are fifty times as resistant as those only five

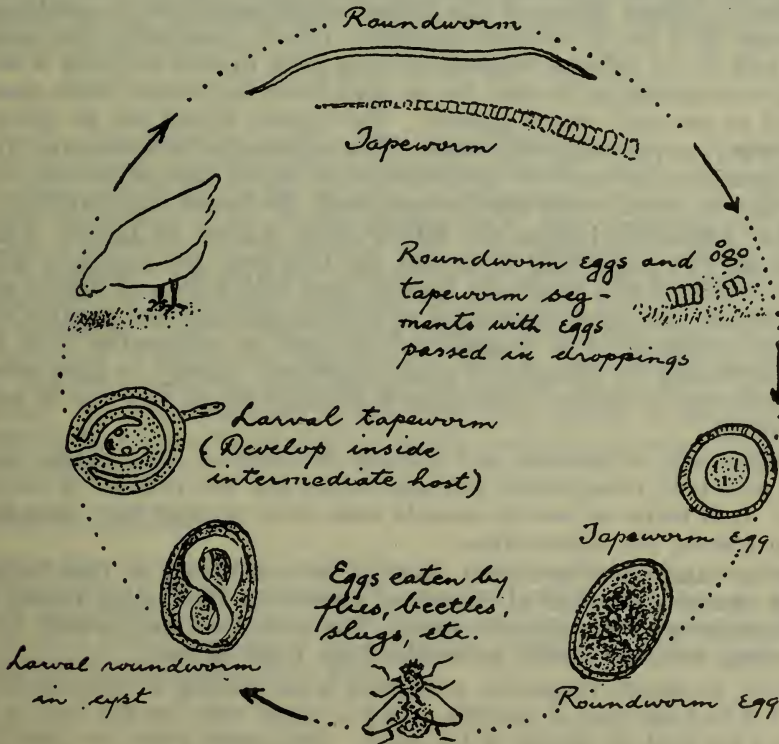


Diagram of the life history of a tapeworm of poultry, and of a roundworm Which requires an intermediate host—some do not. (Adapted from Hall 1931).

days old. This worm is occasionally found inside an egg; this occurs through the worm having wandered up the oviduct and becoming entrapped in the egg at the time it was being formed.

Life-history

Eggs are deposited within the intestine of the bird by worms and are passed out with the droppings. After incubating for about three weeks the egg develops to the point where it is infective. When swallowed by a chicken, the egg hatches and the small larval worm lives among the minute elevations of the intestinal wall until about the tenth day; it then penetrates the mucous membrane and lives there until about the twentieth day, when it emerges into the lumen of the intestine, and after about two months is fully grown.

Treatment

Of the various treatments recommended probably the best is the administration to each bird of a capsule containing tetrachlorethylene, or a somewhat similar drug, carbon tetrachloride. Either of these is given to adult fowls in doses of one cubic centimeter. In treating chickens the dose should be reduced and tried out on a few birds before it is used generally.

Tobacco in some form or another has frequently been recommended, its efficiency depending upon the amount of nicotine present. As nicotine is highly toxic for birds it is usually combined with some other substance to render it safe for administration. The substance most generally used is a certain kind of fullers' earth known as Lloyd's Alkaloidal Reagent. The following formula is satisfactory: Sixteen grams of the fullers' earth mentioned is combined with 7.92 grams (6.6 cc) of nicotine sulphate (Black Leaf 40); the mixture is packed into No. 2 gelatine capsules so that each capsule contains 0.35 gram. One of these capsules is the dose for an adult bird; for younger birds the dose is decreased to one half, or one quarter. The capsule should not be given if the crop is empty, as poisoning may result. The capsules are administered by introducing them into the back of the throat; they should then be located from the outside and be forced down into the crop with the thumb and forefinger.

Other substances besides the fullers' earth known as Lloyd's Alkaloidal Reagent are now being used to protect the bird from the poisonous effects of nicotine. Casein and a substance derived from kelp known as alginic acid are thus employed, and are on the market as nicotine caseinate and nicotine alginate. The latter substance, it is claimed, can be used in combination with kamala without sacrificing the efficiency of either ingredient. Report on these substances are encouraging but further information is desirable before they can be generally recommended.

Combinations of nicotine and kamala are used to some extent for birds affected with both roundworms and tapeworms, but this practice is not recommended. It is better to use the kamala some three or four days after the bird has been treated for roundworms.

Another single dose treatment which gives satisfaction is: One teaspoonful of oil of chenopodium (oil of American wormseed) *thoroughly* mixed with a moist mash for each lot of twelve birds. The medicated mash should be fed in the morning, and food should be withheld the night before.

A flock treatment frequently prescribed is the feeding of tobacco dust containing 1.5 to 2 per cent of nicotine. This is mixed with the dry feed so that it forms two per cent by weight of the mash. This mash is fed for three to four weeks. The tobacco dust should be kept dry and tightly covered, and should be mixed with the mash in quantity sufficient for each day only: if this is not done

the nicotine content is soon reduced. Failures from this treatment are not only due to an inadequate nicotine content in the dust, but also because certain birds do not eat the mash readily.

The Caecal Worm

This worm is found in the caeca or blind guts of poultry, and is exceedingly common. They vary in length from three-tenths of an inch to about one-half an inch, and are often present in enormous numbers. Heavy infestations in young chicks may cause damage resulting in retarded growth or even death. In older fowls, however, they are not as a rule serious to health. The caecal worms are of importance as a factor in the spread of the disease of turkeys known as blackhead or entero-hepatitis. For this, as well as for other reasons, fowls and turkeys should not be kept together.

Life-history

The worm eggs passed with the droppings develop in from seven to twelve days under favourable conditions, and are ready to hatch when swallowed. Hatching in the small intestine the larvae make their way to the caeca, bury themselves in the mucosa for a time, causing considerable damage, and later return to the lumen of caeca where they continue to develop and reach maturity in about twenty-four days after being swallowed. The eggs of the caecal worms may be eaten by earthworms, and subsequently infest fowls or other domesticated birds. In this case the earthworm is not an intermediate host, as it is not essential to the life of the worm, the egg merely being a chance passenger through its intestinal tract: in this way caecal worm and probably other worm eggs are occasionally carried to otherwise uninfected soil, the eggs being passed out in the casts of the earthworm.

Treatment

Owing to their location caecal worms are difficult to reach. A single dose individual treatment that has given satisfaction consists of the rectal injection of oil of chenopodium in a bland oil, such as cottonseed or olive oil. The dose is 0.1 cubic centimeter of oil of chenopodium in 5 cubic centimeters of cottonseed oil for a bird weighing $1\frac{1}{2}$ pounds. For birds weighing 3 pounds or more the dose is doubled. The mixture is made up by adding one teaspoonful of oil of chenopodium to six ounces of cottonseed oil; of this one-third of an ounce is the dose for a 3-pound bird, proportionately smaller doses being used for smaller birds. Injection is made into the rectum with a hard-rubber infant's size syringe. Injection should be made slowly, and the two oils should be well mixed before using. The only treatment by the mouth that appears to be of any value is the tobacco dust treatment as outlined for the large roundworms. This should be used for four weeks.

Hairworms or Capillarids

These worms are usually found lying in close contact with the intestinal mucosa and under a heavy covering of catarrhal exudate. They are slender, practically colourless, and about one-half inch in length, and consequently are difficult to find unless present in large numbers. Infection takes place when the worm eggs are swallowed by a bird.

Treatment

The carbon tetrachloride treatment recommended for large roundworms is advocated, and should be repeated in about one week.

Species of Birds Affected

The common large roundworm of fowls is also found in turkeys, domestic ducks and geese, and a closely related worm occurs in pigeons. The caecal worm of fowls is also found in turkeys, guinea-fowl, domestic ducks and geese. Capillaries of which there are a number of different species are found in all kinds of domesticated birds.

Other Roundworms

In addition to the worms already mentioned other roundworms occur in the intestinal tract of poultry, and in other parts such as the crop, stomach, and gizzard. The only one of sufficient importance to deserve special mention is the gapeworm.

The Gapeworm

The gapeworm is found in the windpipe of a number of wild birds, pheasants, fowls and in turkeys of all ages. In the chick it may cause serious symptoms, but if death does not occur from exhaustion or suffocation the chick usually loses the worms in a few weeks. Turkeys on the other hand usually show no ill effects, but continue to carry the worms: this being one of the reasons why turkeys and chicks should not be allowed to run together.

As with other roundworms, the two sexes are distinct, but with gapeworms they are usually so closely joined together that they appear to be a single worm with two heads, somewhat in the form of a Y. The female is about one-half an inch in length and the male one-fifth of an inch. The heads of the worms are attached to the mucous membrane of the windpipe; they are bloodsuckers and reddish in colour. They are sometimes called red worms or forked worms.

Symptoms

Chickens from ten days to four weeks of age are most frequently affected. The presence of the worms being indicated by a wheezing cough and difficulty in breathing. The bird opens the beak and gapes, hence the name commonly given to the worm. Owing to loss of blood, lack of sufficient air, and disinclination to hunt food, the bird becomes weak and dies from suffocation or general weakness. If the number of worms is small and the bird is strong, it may gape occasionally but not show any other symptoms.

Life-history

Eggs from the mature female worm are either thrown out by the bird when coughing, or are swallowed and passed out with the droppings. The eggs incubate and some of them hatch: the fully incubated eggs or the hatched out young worms are taken in with food or in water by a bird. The larval worms migrate through its tissues until in about a week's time they reach the lungs, and from there get to the windpipe and are fully matured in another week or ten days.

It is known that earthworms may be a factor in the spread of gapeworms. The incubated eggs containing young worms, or recently hatched worms, may be eaten by an earthworm. The larval worm may then work its way into the muscles of the earthworm where it can live for some time. The earthworm is not essential to the life of the gapeworm, so it is not a true intermediate host, but merely a carrier for a passenger protected from weather conditions which might otherwise kill it.

Treatment

Mechanical removal is the only treatment of any value, and it is limited; some of the worms are beyond reach, and there is danger of causing death by suffocation. The commonest form of extractor is probably a medium sized feather which has been stripped of its barbs except for a small tuft at the end: this is inserted into the windpipe and twisted, and is used either dry or moistened with kerosene or turpentine. Any worms that are removed in this way, or that are coughed up by the chick, should be destroyed. Another extractor frequently used is a loop of horsehair, or fine flexible wire. In using these extractors the neck of the chick is held in a straight line, and the first insertion of the feather tip or loop should not be made too deeply; the next time it can be inserted a little further. Two or three twists are made and the extractor is withdrawn quickly, but gently.

Prevention is better than cure, and this lies largely in the fact that chicks should not be raised on land which is, or has been, used by turkeys.

The Prevention of Roundworms

No matter what treatment is used to rid fowls of worms, other measures should be adopted to prevent reinfestation. The houses should be cleaned out and thoroughly scrubbed with a solution of hot lye. The litter and droppings should be burnt or placed out of reach. The top four to six inches of the soil should be removed; if this is impracticable the soil should be well covered with unslaked lime and then ploughed. The worm eggs are not as resistant as coccidia, but they may live for a year or more. The soil should be stirred up at frequent intervals, and kept as dry as possible. Droppings should be removed frequently.

It should be remembered that birds under four months of age suffer far more than older birds, and every advantage should be given them. Preferably they should not be raised on the same ground as adult birds, and if new ground can be given them, so much the better.

The danger from parasites increases with the number of birds and the length of time they are kept on the same piece of ground.

Practically parasite-free birds can be raised if a system of rotation of yards is followed. When three fields are available, two can be put into crop while the other is used for growing birds: in this way the same ground is not used by poultry the second time until the fourth year.

ITEMS OF INTEREST

Young birds suffer the most from parasites. Keep them away from adult birds, and on ground that has not been used by poultry for at least one year.

Don't overstock. This concentrates the parasites in a given area and increases the chances of infection.

Do not keep turkeys and chickens on the same ground. Turkeys carry gapeworms to chickens, and fowls carry the organisms of blackhead to turkeys in caecal worms or their eggs.

Infection by coccidia, roundworms or tapeworms is contracted through the mouth.

Eggs of worms are infective after they reach a certain stage of development; with tapeworms this requires that they be eaten by certain slugs, snails, beetles or flies, which are in turn eaten by poultry. One worm egg only produces one worm, but one coccidium gives rise to an enormous number of coccidia.

Coccidia develop to the infective stage very rapidly. Prompt disposal of infected droppings is the secret of success in outbreaks of coccidiosis.

Keep poultry manure covered, and the yards clear of trash or piles of weeds, straw or manure that might serve as the breeding place for flies or beetles.

Keep the yards dry. Fill in water holes. Fix leaky taps. Dryness is unfavourable for the development of worm eggs and coccidia.

Prevention is better than cure. A system of rotation whereby the same ground is not used for poultry the second time until the fourth year, will reduce losses from parasites to a minimum.

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1932